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EXAMINER	
THANGAVELU, KANDASAMY	
ART UNIT	**PAPER NUMBER**
2123	

DATE MAILED: 02/23/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/973,786	JACKSON ET AL.	
	Examiner	Art Unit	
	Kandasamy Thangavelu	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 December 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *19-36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *19-22,24-30 and 32-35* is/are rejected.

7)☒ Claim(s) *23,31 and 36* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 December 2005* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This communication is in response to the Applicants' amendment mailed on December 16, 2005. Claims 1-18 were canceled. Claims 19-36 were added. Claims 19-36 of the application are pending. This office action is made final.

Drawings

2. The drawing mailed on December 16, 2005 is objected to. In Fig.1, the characters in Step S1700 and step S1800 are too small making it impossible to read the contents. Therefore a substitute drawing is required.

Claim Objections

3. The following is a quotation of 37 C.F.R § 1.75 (d)(1):

> The claim or claims must conform to the invention as set forth in the remainder of the specification and terms and phrases in the claims must find clear support or antecedent basis in the description so that the meaning of the terms in the claims may be ascertainable by reference to the description.

4. Claims 27 and 32 are objected to because of the following informalities:

Claim 27, Line 13, "means for adjusting the weights of at least control system models" appears to be incorrect and it appears that it should be "means for adjusting the weights of at least two control system models".

Claim 32, Line 13, "based on their prediction error" appears to be incorrect and it appears that it should be "based on their prediction errors".

Appropriate corrections are required.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the first paragraph of 35 U.S.C. §112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. Claims 22, 23, 30 and 35 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

6.1 Claim 23, 30 and 35 state, "each model is used to predict, at a current time t, **a future state of the multiple actuator-sensor smart matter dynamic control system** at a later time $(t+\Delta t)$:

$$x_i\,(t + \Delta t;\, x(t),\, u(t)),$$

where $x(t)$ is **a state of a multiple actuator-sensor smart matter dynamic control system** at time t, $x_i\,(t + \Delta t)$ is **a state of a multiple actuator-sensor smart matter dynamic control system** at time $t + \Delta t$ estimated by the i^{th} model, and $u(t)$ is a control input at time". This is incorrect. The $x(t)$ and the $x_i\,(t + \Delta t)$ should be the current and future states of the system being

controlled and not the states of **a multiple actuator-sensor smart matter dynamic control system.**

Claims rejected but not specifically addressed are rejected based on their dependency on rejected claims.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

8. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

9. Claims 19-21, 24, 26, 27-29 and 32-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Jacques** (U.S. Patent Application 2003/0028266) in view of **Wojsznis et al.**

(U.S. Patent 6,577,908), and further in view of **Spoerre et al.** (U.S. Patent 5,602,761) and **Suzuki et al.** (U.S. Patent 6,807,448).

9.1 **Jacques** teaches tuning control parameters of vibration reduction and motion control systems for fabrication equipment and robotic systems. Specifically as per claim 32, **Jacques** teaches Smart matter distributed dynamic controllers for a system, each controller comprising one or more actuator-sensor pairs (Page 1, Para 0001 and Para 0005; Page 2, Para 0010; Page 3, Para 0019 and Para 0020; Page 4, Para 0032), each dynamic controller further comprising:

a measurement circuit for measuring actual performance of the system after said one or more time intervals (Page 4, Para 0034);

a predicting circuit for computing a prediction error as the difference between the predicted performance and the measured actual performance of the subsystem controlled by the controller (Page 4, Para 0034).

Jacques teaches one control system model (Page 3, Para 0019; Page 4, Para 0032); and an execution circuit for executing the control system model and predicting future performance of the system after one or more time intervals (Page 3, Para 0019, Para 0020 and Para 0022; Page 2, Para 0010; Page 4, Para 0032). **Jacques** does not expressly teach one or more control system models; and an execution circuit for executing each of control system models and predicting future performance of the system after one or more time intervals as a weighted sum of individual predictions of each model for each controller. **Wojsznis et al.** teaches one or more control system models (CL4, L48-51; CL3, L41-45); and an execution circuit for executing each

of control system models and predicting future performance of the system after one or more time intervals (CL2, L13-18), as a weighted sum of individual predictions of each model for each controller (CL3, L52-57; CL2, L13-18). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the controller of **Jacques** with the controller of **Wojsznis et al.** that included one or more control system models; and an execution circuit for executing each of control system models and predicting future performance of the system after one or more time intervals as a weighted sum of individual predictions of each model for each controller because that would allow attainment of adaptation with reduction in process excitation, shorter adaptation time, and simplicity in design (CL3, L31-34).

Jacques teaches creating an updated model for the behavior of the physical system and deriving optimal controllers based on the updated model (Page 3, Para 0020; Page 3, Para 0022). **Jacques** does not expressly teach an adjustment circuit for adjusting the weights of at least two control system models based on their prediction errors relative to the prediction errors of other models. **Spoerre et al.** teaches an adjustment circuit for adjusting the weights of at least two control system models based on their prediction errors relative to the prediction errors of other model (CL9, L31-39). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the controller of **Jacques** with the controller of **Spoerre et al.** that included an adjustment circuit for adjusting the weights of at least two control system models based on their prediction errors relative to the prediction errors of other models because that would allow varying the rate of decay of the weights and in turn the amount of information recollected from the past; and giving more or less weight to the most recent observation (CL9, L45-52).

Jacques does not expressly teach adjusting the weights of at least two control system models includes increasing a weight of at least one control system model in the plurality of control system models relative to a weight of at least one other model. **Suzuki s et al.** teaches adjusting the weights of at least two control system models includes increasing a weight of at least one control system model in the plurality of control system models relative to a weight of at least one other model (CL1, L14-20; CL2, L64-67). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the controller of **Jacques** with the controller of **Suzuki et al.** that included a weight increasing circuit usable to increase the weight of the at least one more successful control system model relative to the at least one other model because that would allow a weight identification method and a feedback control method that would reduce the amount of calculation for estimating the weights of the models (CL2, L40-44; CL3, L12-14).

Jacques does not expressly teach an implementation circuit that uses the control system models and the adjusted weights in the dynamic controllers for dynamic control of the system during next time interval. **Wojsznis et al.** teaches an implementation circuit that uses the control system models and the adjusted weights in the dynamic controllers for dynamic control of the system during next time interval (Abstract L1-14; CL2, L13-18; CL3, L52-57; CL4, L48 to CL5, L2).

9.2 As per Claims 19 and 27, these are rejected based on the same reasoning as Claim 32, supra. Claims 19 and 27 are a method claim and a smart matter distributed dynamic controllers

with a means for claim reciting the same limitations as Claim32, as taught throughout by **Jacques, Wojsznis et al., Spoerre et al.** and **Suzuki et al.**

9.3 As per claim 33, **Jacques, Wojsznis et al., Spoerre et al.** and **Suzuki et al.** teach the smart matter distributed dynamic controllers of claim 32. **Wojsznis et al.** teaches the plurality of control system models comprises N control system models, and each of the N control system models is initially assigned a weight w_i (CL2, L13-18; CL3, L40-45; CL3, L52-55). **Spoerre et al.** teaches that initially assigned weight w_i are selected such that $\Sigma_{i=1}^{N} w_i = 1$ (CL9, L17-52; CL9, L40-43).

9.4 As per Claims 20 and 28, these are rejected based on the same reasoning as Claim 33, supra. Claims 20 and 28 are a method claim and a smart matter distributed dynamic controllers with a means for claim reciting the same limitations as Claim 33, as taught throughout by **Jacques, Wojsznis et al., Spoerre et al.** and **Suzuki et al.**

9.5 As per claim 34, **Jacques, Wojsznis et al., Spoerre et al.** and **Suzuki et al.** teach the smart matter distributed dynamic controllers of claim 32. **Spoerre et al.** teaches adjusting the weight of each control system model includes defining a fraction a_i of a weight w_i, of an i^{th} model, where $0 < a_i < 1$, which will be adjusted for the next time interval (CL9, L31-39).

9.6 As per Claims 21 and 29, these are rejected based on the same reasoning as Claim 34, supra. Claims 21 and 29 are a method claim and a smart matter distributed dynamic controllers

with a means for claim reciting the same limitations as Claim 34, as taught throughout by **Jacques, Wojsznis et al., Spoerre et al.** and **Suzuki et al.**

9.7 As per claims 24 and 26, **Jacques, Wojsznis et al., Spoerre et al.** and **Suzuki et al.** teach the method of claim 19. **Jacques** teaches repeating the predicting, determining and adjusting steps for successive time intervals (Fig. 1, Fig. 3 and Fig. 4); and adding new models (Page 3, Para 0019 and Para 0020).

10. Claims 22, 30 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Jacques** (U.S. Patent Application 2003/0028266) in view of **Wojsznis et al.** (U.S. Patent 6,577,908), **Spoerre et al.** (U.S. Patent 5,602,761) and **Suzuki et al.** (U.S. Patent 6,807,448), and further in view of **Muravez** (U.S. Patent Application 2004/0155142).

10.1 As per claim 35, **Jacques, Wojsznis et al., Spoerre et al.** and **Suzuki et al.** teach the smart matter distributed dynamic controllers of claim 32. **Jacques, Wojsznis et al., Spoerre et al.** and **Suzuki et al.** do not expressly teach that each model is used to predict, at a current time t, a future state of the multiple actuator-sensor smart matter dynamic control system at a later time $(t+\Delta t)$: $x_i(t + \Delta t; x(t), u(t))$, where $x(t)$ is a state of a multiple actuator-sensor smart matter dynamic control system at time t, $x_i(t + \Delta t)$ is a state of a multiple actuator-sensor smart matter dynamic control system at time $t + \Delta t$ estimated by the i^{th} model, and $u(t)$ is a control input at time t. **Muravez** teaches that each model is used to predict, at a current time t, a future state of the multiple actuator-sensor smart matter dynamic control system at a later time $(t+\Delta t)$:

x_i (t + Δt; x(t), u(t)), where x(t) is a state of a multiple actuator-sensor smart matter dynamic control system at time t, x_i (t + Δt) is a state of a multiple actuator-sensor smart matter dynamic control system at time t + Δt estimated by the i^{th} model, and u(t) is a control input at time t (Page 9, Para 0091), because that allows using the predicted future states to calculate residual errors and variances and compute the weights of the models (Page 9, Para 0088 and 0089). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the controller of **Jacques, Wojsznis et al., Spoerre et al.** and **Suzuki et al.** with the controller of **Muravez** that included each model being used to predict, at a current time t, a future state of the multiple actuator-sensor smart matter dynamic control system at a later time (t+Δt): x_i (t + Δt; x(t), u(t)), where x(t) was a state of a multiple actuator-sensor smart matter dynamic control system at time t, x_i (t + Δt) was a state of a multiple actuator-sensor smart matter dynamic control system at time t + Δt estimated by the i^{th} model, and u(t) was a control input at time t. The artisan would have been motivated because that would allow using the predicted future states to calculate residual errors and variances and compute the weights of the models.

10.2 As per Claims 22 and 30, these are rejected based on the same reasoning as Claim 35, supra. Claims 22 and 30 are a method claim and a smart matter distributed dynamic controllers with a means for claim reciting the same limitations as Claim 17, as taught throughout by **Jacques, Wojsznis et al., Spoerre et al., Suzuki et al.** and **Muravez.**

11. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Jacques** (U.S. Patent Application 2003/0028266) in view of **Wojsznis et al.** (U.S. Patent 6,577,908), **Spoerre et al.** (U.S. Patent 5,602,761) and **Suzuki et al.** (U.S. Patent 6,807,448), and further in view of **Raeth et al.** (U.S. Patent Application 2003/0065409).

11.1 As per claim 25, **Jacques, Wojsznis et al., Spoerre et al.** and **Suzuki et al.** teach the method of claim 19. **Jacques, Wojsznis et al., Spoerre et al.** and **Suzuki et al.** do not expressly teach summing prediction error over a multiple intervals for each prediction model for use in adjusting the weights. **Raeth et al.** teaches summing prediction error over a multiple intervals for each prediction model for use in adjusting the weights (Page 2, Para 0015, Para 0018and Para 0021). It would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the method of **Jacques, Wojsznis et al., Spoerre et al.** and **Suzuki et al.** with the method of **Raeth et al.** that included summing prediction error over a multiple intervals for each prediction model for use in adjusting the weights because that would allow a signal processing method and system for detecting events of interest based on predicting values related to future data samples (Page 4, Para 0062).

Allowable Subject Matter

12. Claims 23, 31 and 36 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

13. Applicant's arguments filed on December 16, 2005 have been fully considered. The arguments with respect to 103 (a) rejections are moot in view of the cancellation of claims 1-18.

13.1 As per the applicants' argument that "one of ordinary skill in the art would not have been motivated to combine Phillips with Jacques; Jacques discloses using a model to estimate the behavior of an apparatus, and using the estimated result to control the behavior of the apparatus; the purpose for estimating the behavior of the apparatus is to use the estimated result to control the behavior of the apparatus; Phillips is directed to prediction input in forecasting contests; Phillips discloses giving more weight to clustered predictions that have historically better prediction accuracies; the weights are merely used in forecasting, such as in wagering event related to stock market or a Super Bowl game; the weights are used only in attempts to match the result of an event; the weights are not provided for controlling the outcome of the event; Phillips is not directed to controlling the behavior of an apparatus; One of ordinary skill in the art would not have been motivated to combine Phillips with Jacques because in the Jacques system, which <u>controls</u> behavior, there is simply no need for or benefit to be gained from, <u>predicting</u> behavior as per Phillips.", the examiner has used the reference **Wojsznis et al.**

Wojsznis et al. teaches one or more control system models (CL4, L48-51; CL3, L41-45); and an execution circuit for executing each of control system models and predicting future performance of the system after one or more time intervals (CL2, L13-18), as a weighted sum of individual predictions of each model for each controller (CL3, L52-57; CL2, L13-18). **Wojsznis et al.** teaches an implementation circuit that uses the control system models and the adjusted weights in the dynamic controllers for dynamic control of the system during next time interval (Abstract L1-14; CL2, L13-18; CL3, L52-57; CL4, L48 to CL5, L2).

13.2 As per the applicants' argument that "one of ordinary skill in the art would not have been motivated to combine Phillips with Wojsznis; Wojsznis discloses using models, each of which is characterized by a plurality of parameters; each of the parameters has a respective value that is selected from a set of predetermined initialization values for corresponding to the parameter; Wojsznis further discloses using an adaptive parameter whose value is calculated for each parameter; the adaptive parameter value is the weighted average of the initialization values assigned to the respective parameters; the weighting is used among parameters of <u>one</u> model. Wojsznis does not disclose or suggest weighting between two or more models; Phillips discloses giving more weight to clustered predictions that have historically better prediction accuracies; Phillips discloses providing different weights to different predictions; the weighting disclosed in Phillips is not a weighting between different parameters of one prediction model; although Phillips and Wojsznis both disclose "weighting," their concepts of "weighting" are different; one of ordinary skill in the art would not have been motivated to combine Phillips with Wojsznis because the "weighting" of Phillips is incompatible with the "weighting" of Wojsznis., the

examiner has used only the reference **Wojsznis et al.** Applicants' attention is directed to Paragraph 13.1 above.

13.3 As per the applicants' argument that "Jacques, Raeth, Phillips and Wojsźnis, even if combined, do not disclose or suggest adjusting the weights of at least two control system models that include increasing a weight of at least one control system model relative to a weight of at least one other model, and using the control system models and the adjusted weights in the dynamic controllers for dynamic control of the system during next time intervals, as recited in claim 19, and similarly recited in claims 27 and 32; Phillips does not disclose or suggest using adjusted weights in the dynamic controllers for dynamic control of the system during next time interval; Wojsznis does not even disclose or suggest adjusting weights of at least two control system models; Phillips does not supply the subject matter admittedly lacking in Jacques, and Wojsznis does not supply the subject matter lacking in Jacques and Phillips; Raeth, Spoerre and Muravez do not disclose or suggest the subject matter lacking in Jacques, Phillips and Wojsznis; Jacques, Raeth, Phillips, Wojsznis, Spoerre and Muravez, even if combined, do not disclose or suggest the subject matter recited in claims 19, 27 and 32, and claims 20-26, 28-31 and 33-36 depending therefrom", the examiner has used **Jacques, Wojsznis et al., Spoerre et al.** and **Suzuki et al.** which teach these limitations.

Spoerre et al. teaches an adjustment circuit for adjusting the weights of at least two control system models based on their prediction errors relative to the prediction errors of other model (CL9, L31-39). **Suzuki s et al.** teaches adjusting the weights of at least two control

system models includes increasing a weight of at least one control system model in the plurality of control system models relative to a weight of at least one other model (CL1, L14-20; CL2, L64-67).

Conclusion

ACTION IS FINAL

14. Applicant's amendments necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Kandasamy Thangavelu whose telephone number is

571-272-3717. The examiner can normally be reached on Monday through Friday from 8:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo Picard, can be reached on 571-272-3749. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to TC 2100 Group receptionist: 571-272-2100.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Paul L. Rodriguez 2/16/06
Primary Examiner
Art Unit 2125

K. Thangavelu
Art Unit 2123
February 13, 2006